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Framework Legal Instrument on Biological Diversity: An Analysis of Possible Financial Mechanisms

A Study Prepared for the United Nations Environment Programme */

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I. INTRODUCTION

1. In the 18 years that have elapsed since the Stockholm Conference there has been growing concern, if not anxiety, in both developed and developing countries about the proper management of environmental quality and natural resources. The problems that arise are not new. What is new is their scope and the scale of their impact. Rapidly increasing population, ill-considered and destructive development strategies without consideration of the natural resource base, and the use of inappropriate and potentially dangerous technologies have all contributed to the emergence of a new agenda of environmental concerns. The new agenda is centrally concerned with the life-supporting systems of the earth's biosphere. The challenges that we face must be met through a broad spectrum of policy analysis and action which is both politically acceptable and economically efficient.

2. One of the most important challenges to be met concerns the extinction of species. The main cause is the loss of habitat of these species such as wetlands, estuaries, lakes, highlands, and temperate and tropical forests.

3. Most of the species currently in danger are unknown to science. Mankind is thus dealing with a major area of risk and uncertainty. It is necessary to proceed with caution. In reality, the current rate of extinction of species is unprecedented. It has been noted that it will take millions of years to correct the loss of genetic and species diversity engendered by current destruction of their natural habitats.

4. In the consideration of the current rate and extent of this destruction, a number of inter-related issues arise: (i) the unprecedented present scale of genetic erosion threatens to bring an ecosystems collapse, and thus constitutes a threat to all nations; (ii) the animal and plant species in question serve a number of critical and increasingly important industrial, medicinal and other purposes; (iii) the loss of a unique, unstudied organism will involve an irreversible loss to science; and finally (iv) the conservation of biological diversity requires a level of financial resources and scientific and technical know-how that is not easily available to the habitat countries. It is in the light of these considerations that international responsibility in the conservation of biological diversity must be evaluated.

II. INTERNATIONAL RESPONSE

5. The Ad Hoc Working Group of Experts on Biological Diversity, at its second session from 19 to 23 February 1990 in Geneva, concluded that a legal instrument should aim to produce concrete and action-oriented measures for the conservation and sustainable utilization of genetic resources. General agreement was reached on areas which represent basic conservation needs that would lead to implementation and funding measures, even though the magnitude of the cost of a global convention would need to be estimated further through a special study. Furthermore, it was agreed that an international legal instrument without a firm commitment to funding to meet the conservation costs would be unproductive. The Working Group felt that innovative mechanisms should be explored at both national and international levels.

6. The compelling reason for the continuance of the current untenable exploitation of genetic resources is to be found in policy and market failures.

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7. Arguably, economic needs could often lead to the over-use or misuse of resources. The degradation of resources tends to be incremental and cumulative. Sound environmental management requires that the solutions sought should be sufficiently comprehensive and dynamic for them to have a positive impact on the system as a whole. What is sought, in effect, is a series of critical transitions in terms of energy, demographic policy and, above all, natural resource use.

8. These transitions are not likely to be easy to achieve (particularly for developing countries): they will require financial and technology transfers, availability of manpower resources, and overt organizational arrangements, including financial mechanisms. But the alternative, in terms of damage incurred and eventual loss of viability, is such as to make the cost-benefit analysis tilt in favour of early action.

9. The new environmental agenda not only brings the relationship between environment and development more sharply into focus, it is global in scope and requires policy decisions of a new type. The issue of interdependence is coming more and more to the fore, as well as the importance of caring for the global commons and for shared natural resources. Long-term environmental threats, which are often slow to develop, are seen more clearly in comparison with overall development and growth objectives.

10. Genetic resources serve a number of functions in production. Of particular importance are supplies of medicinal and food resources. A large variety of pharmaceutical drugs (annual sales estimated at between $8-$20 billion) derive from plant and animal species. One fourth of all prescription drugs are said to contain an active ingredient derived from plants. Many drugs that are now synthesized (e.g. histamines, contraceptives, cortisone, etc.) were originally discovered in wild plants. It is estimated that 70 per cent of all plant species so far known to have anti-cancer properties are tropical plants, and the tropical forests contain literally thousands of species whose potential has not yet been tested. According to the World-Wide Fund for Nature, a plant native to Madagascar, Catharanthus roseus, contains two widely used, powerful anti-cancer drugs of which global sales at the manufacturers' level amount to more than $150 million per annum. Research continues into the anti-cancer properties of plants, but loss of biological diversity threatens species that might have been used for medication. It is also worth noting that many of the products now cultivated such as cocoa, coffee, tea, rubber, nutmeg etc., were initially collected in the forests and still depend on the wild varieties for cross-breeding. Among key food crops that depend on genetic material from tropical moist forests are wheat and rice, bananas and citrus fruits, worth large sums on the market in yearly sales. Through the use of genetic material they could be improved in terms of yield and variety or made resistant to pests.

11. Not least among the values of genetic resources is the fact that they contain a large reserve of still unknown fucntions. One day these functions could be found to be of great service to mankind. Apart from the intrinsic and ethical value of the species themselves, the present rate of conversion is destroying an economic option value which mankind cannot afford to neglect from the point of view of the well-being of present and future generations.

12. The economic and social value of biological diversity is consistently underestimated. There are many reasons for this undervaluation, which encourages further conversion and degradation.

13. One of the principal reasons is that neither public authorities nor consumers and producers are receiving the correct economic signals from the market place. The market prices of the genetic resources and functions do not reflect their real scarcity value or the ecological costs incurred by their use. These signals encourage individuals, industries and Governments to further exploit these resources.

14. The impetus behind these transactions is to be found in market and policy failures. Market failures reflect (i) the fact that some markets are not operating effectively and (ii) that some markets do not exist. In consequence, what happens is that costs that should be internalized are transformed into externalities. Policy failures are reflected in the shape of taxes, concessions, subsidies, price controls and other fiscal measures. They stem from both the application of ill-considered policies with negative impacts and from deliberate support for vested interests. They also stem in large measure from the assignment of proprietary rights in national legal systems, under which terms the biological resources often remain outside the market system and hence are considered free goods.

15. In dealing with the loss of biological diversity, as with other environmental and resource management problems, anticipation and prevention are always more effective and less costly than corrective measures. In the present situation of accelerated destruction, it is imperative that developing countries take early action to reduce the future burden on themselves. It is equally important that the international community take account of the full costs of the loss of the use value, the option value and the existence value of genetic resources and reflect these costs in the transfer of the necessary funds required, as well as in the establishment of appropriate financial mechanisms for the purpose. This is not a once-and-for-all calculation of costs and benefits, but a process of change in which the exploitation of resources, the direction of economic activities, the orientation of technological development and the development of financial mechanisms are all in harmony and enhance both present and future options to meet global needs.

16. It is in this context that the present study attempts to highlight a number of issues that the Working Group might want to consider before deciding on a financial mechanism in terms of the framework legal instrument. None of the views expressed should be attributed to individual Governments or organizations. The views stated are the responsibility of the consultant. In preparing the study, the consultant has been fully aware of the current discussions and developments in respect of financial transfers and funding mechanisms envisaged for the amendments to the Montreal Protocol.

III. NATURE AND SCOPE OF FINANCIAL MECHANISMS

17. It is implicit in the issues discussed that the transfer of financial resources should be adequate, and the financial mechanisms established should be effective and efficient, in order to reduce the current loss of biodiversity. At the same time, it is now clear that there is a serious shortfall in funding for the maintenance of the environment as a whole. The emergence of the new planetary problems, amongst them the depletion of the ozone layer, the emission of greenhouse gases leading to climate change and global warming, the treatment of hazardous wastes, etc. shows that we are far from maintaining the Earth, which we have leased, in full repair.

18. In view of the urgency of the problems relating to the extinction of species on the one hand, and the complexity and size of financial transfers needed for the planetary problems on the other, it will be worthwhile for the Working Group to concentrate on (i) the need to stem the loss of biological diversity; (ii) considerations of the financial and technological issues that arise in that connection; and (iii) an attempt to reach a broad-based agreement on the financial mechanisms that will enable both developing and developed countries to meet global conservation needs for the maintenance of biological diversity in a timely and satisfactory manner. At a later stage, the financial mechanisms thus identified and initiated could be incorporated into the larger arrangements for the other planetary problems, as and when these arrangements are set up.

19. In this connection, it is useful to begin by identifying the financing needs of the developing countries. These are currently in thre parts. First, there are the conventional needs for development assistance. The resources available for this purpose take the form of voluntary contributions. Although these have been an important source of financing for economic and social development in the past, the process today appears to be losing momentum. Not only has the level of Official Development Assistance remained stagnant (actually declining as a percentage of the GNP of donor countries - OECD members - from 0.34 per cent in 1976 to lower levels), there is now a reverse flow for the repayment of debt, which in 1988 amounted to $43 billion as against total Official Development Assistance of $56 billion.

20. Second, there is the need for financing to undertake national sustainable development programmes effectively, or to cover what may be called the unmet conservation needs of the developing countries. According to the UNDP and World Resources Institute (WRI), International Conservation Financing Project Report, these needs would amount to roughly $20 - 50 billion per year for the next decade. The World Watch Institute estimates total additional expenditures rising from $46 billion in 1990 to $149 billion in the year 2000.

21. Third, there are the financial requirements to meet the emerging planetary problems. No accurate or even approximate estimates of financial requirements to meet the different scenarios of abatement or containment have emerged so far. The most advanced are estimates of what the developing countries would need to accept the discipline of the Montreal Protocol. These estimates range from $3 to $6 billion, spread over the period from 1990 to 2008 (when the 10-year grace period envisaged for developing countries as of the general implementation date of 1988 would expire). The estimates for dealing with the greenhouse gases (leading to climate change and global warming) are rough; figures ranging from $26 to $65 billion have been mentioned. The extent of financial transfers within a Framework Legal Instrument on Biodiversity is being worked out on a technical level, which will be subject to political bargaining later.

22. The developing countries consider that any financial transfers undertaken should have the following basic desiderata:

(a) Additionality of the funds in terms of levels, sources and uses (not diverted from current urgent development programmes and projects in pursuit of actions that primarily benefit the global environment);

(b) Concessionality of assistance in the form of grants, highly concessional loans, which are especially not subject to conditions or leverage on structural adjustments etc.;

(c) A new financing mechanism that is equitable and efficient, and focused on preventing the loss of biological diversity, so as to ensure additional, clearly earmarked financial commitments;

(d) Incremental costs associated with the conservation of biodiversity or dealing with other planetary problems (e.g. ozone layer depletion) should be funded by (i) developed countries and (ii) cover all additional expenditures;

(e) Recognition by recipient countries that the activities supported by the financial transfers are consistent with their own development objectives and not imposed on them from outside;

(f) Finally, the global benefits for which the financial transfers are made and accepted should be assessed on the basis of the best available scientific and technological options.

23. The first two desiderata have received a large measure of agreement, although there is no concensus. On the subject of incremental costs, opinion is divided as to whether all such costs are to be met from international sources or only certain agreed costs. But this is not likely to be a major divisive issue. What is more important is to reach a framework agreement (taking account of the total costs involved) on the sources of financing and types of funding mechanisms which could be put into place quickly.

IV. FUND RAISING

24. With regard to the sources of financing, it should be noted that some Governments are already investing considerable sums in national conservation projects and multilateral/bilateral donor agencies are also taking up such projects and programmes in increasing numbers; but these flows are inadequate for quantitative and qualitative reasons. It is unlikely that the quantity of available resources could be increased in the near future through higher taxation (not an attractive or even politically feasible proposition in most donor countries) or increased lending by multilateral financing institutions raising funds in the capital markets for the purpose. As to quality, by their very nature and long-term gestation periods, programmes to deal with the loss of biological diversity must depend on high levels of concessional funding. In dealing with conservation of biological diversity it is necessary to move away from the prescriptions of capital finance to the principles of public finance.

25. Basically, what is at issue in the effort to stem the extinction of biodiversity is insurance against a possible future risk. That risk is too high to be ignored or minimized. In order to cover the risk, insurance premiums are necessary. Such insurance premiums are normally a percentage of net savings (say between 5 and 10 per cent). Since many of the habitat countries are least developed countries or countries with a net domestic savings level that is inadequate for urgent and pressing development or even survival needs, the question arises as to whether their contributions (insurance premiums) could be met by the international community. There is broad agreement among many economists that when there is a planetary threat

leading to a damaging impact on the global commons, investment expenditures for containment or conservation strategies (of which the benefits can only be assessed on an international scale) cannot be carried out by commercial loans or with the use of conventional assistance earmarked for economic and social development purposes.

26. The transfer of financial resources for international purposes is one aspect of the matter. The other aspect of the matter is raising the funds internally. It is necessary to pay close attention to users' fees and other charges (e.g fees for certain uses of biodiversity: the exploitation of gerplasm for breeding programmes or the development of new drugs; harvesting in fishery, forestry or of authorized wildlife products; recreational uses in the promotion of and gains from tourism; the recycling and disposal of wastes; etc.) that help to internalize the economic and environmental costs of loss of biodiversity within the operational costs of resource use. Industrial, commercial and trade enterprises that profit from the business in biological diversity could thus be presented with the full incremental costs of their activities. The users' fees would accordingly (i) raise considerable funds for international purposes; (ii) curb excessive use of genetic resources; and (iii) provide a more effective and efficient ecological control mechanism.

V. FUND ADMINISTRATION AND MANAGEMENT

27. The financial mechanisms sought to manage the financial transfers could be a new Fund, or a new facility or a "window" in an existing institution (e.g. the World Bank), or co-operative arrangements, based on comparative advantage, among a number of international organizations (e.g. UNEP, World Bank, FAO, UNDP and others) or a combination of all three. The developing countries have on many occasions expressed strong support for the idea of a Fund established with a financial and technical secretariat under the overall supervision and control of the Parties to a Framework Legal Instrument on Biodiversity and consider it the most appropriate arrangement to reflect global responsibility. Others are of the opinion that financial mechanisms involving existing channels of multilateral and bilateral assistance could be adequate.

28. The establishment of an individual Fund under the control and supervision of the Parties needs further consideration. At the heart of this matter are two issues. First, whether an arrangement of this nature could induce a sense of global interdependence and global responsibility, and could thus redress the free-rider problem, since all countries will be sharing a common burden. Second, whether and to what extent contributions to such a Fund could be supplemented by financial and technical resources coming from existing multilateral/bilateral sources. These issues should be considered in the context of (i) international arrangements currently under consideration for financial and technology transfers in terms of the Montreal Protocol; (ii) the contribution of existing multilateral institutions, such as, FAO, the International Fund for Agricultural Development (IFAD), Consultantive Group on International Agricultural Research (CGIAR), the Tropical Forestry Action Plan (TFAP), the International Union for Conservation of Nature and Natural Resources (IUCN), UNDP, World Bank; and (iii) the possibility that the level of contributions from different sources could fall short of the actual needs, so a "safety net" in the form of a residual Fund should be in place.

VI. CONTRIBUTIONS AND DISBURSEMENTS

29. Contributions to such a Fund will be from a multiplicity of sources:

(a) Voluntary contributions, paid by the Parties on an informally agreed assessment basis;

(b) License fees and royalties, arising from intellectual property rights vested in the Fund;

(c) Funds raised by collections and receipts from events organized for the benefit of the Fund;

(d) Funds borrowed by the Fund;

(e) Other resources authorized by the Contracting Parties.

30. Whatever form the financial mechanism may take, there must be a clear understanding of the scale of assessment or burden sharing amongst donors. The scale of assessment could be a percentage of the GNP or could be related to industrial and commercial exploitation of genetic resources or trade in such resources during the past 5 years. It is not strategically important whether the contributions to a Fund or financial mechanisms are voluntary or mandatory, as long as they are assessed.

31. Payments from the Fund will be made for the financial and technical secretariat needed to service the Fund, and to provide certain general support functions, such as the organization of meetings of the Contracting Parties, of the Executive Board and other technical meetings; liaison with international and national research and technical organizations, as deemed necessary; and maintenance of an updated register of all designated areas in which the conservation of biological diversity is to be ensured, etc. More substantively, funds will be made available to meet basic conservation needs. Such needs will comprise, in addition to the co-ordination of conservation management strategies and plans with initiatives for sustainable development and priority conservation projects, (i) technical assistance for research, training, education, awareness building, surveys, etc.; (ii) monitoring and (iii) technology transfer. In view of the urgency of conservation needs, the first category of expenditures (i.e. secretariat costs) should not exceed 25 per cent of the total disbursements.

32. The channelling of funds will be through grants or loans on concessional terms to the Parties or to certain organizations to enable or help them to undertake the conservation of biological diversity. This could be either through Governments or with their concurrence. This may raise certain problems with both donors and habitat countries but, if we draw up a balance, it will seem that the latter alternative has advantages in terms of a sharper focus on conservation needs, savings in administrative costs, and avoidance of time-consuming bureaucratic procedures.

VII. RESIDUAL ISSUES

33. There are also certain unresolved issues relating to the administration and management of the Fund or the financial mechanism put in place. If it is an independent Fund, it will need to be administered by the Parties. The Parties may wish to elect, on the basis of equitable geographic distribution

and periodic tenure, an Executive Committee or Board to administer the Fund. Grants and loans made from the Fund, on the basis of assessments by the secretariat, will follow decisions made by the Board. In the case of financial mechanisms other than a Fund, these functions would need to be negotiated. Clearly, the countries concerned must participate in the decision-making process if the sense of global interdependence and of shared responsibility that is so essential for the financing of a global approach to the conservation of biological diversity is to be realized.

34. In the case of the Montreal Protocol, the time frame for the transfer of financial resources to developing countries is seen as coming to an end with the completion of the 10-year grace period extended to them (i.e. by 2008). In the case of arrangements for biological diversity, the time frame for providing assistance would appear to depend on the rate of extinction of species reaching an equilibrium level or when the number of participating countries falls below an agreed amount. The Fund or financial mechanisms established will then be terminated and the remaining assets distributed in an equitable manner to those who had made initial contributions.

35. The activities of the Fund or funding mechanisms shall be in pursuance of a Long-Term Action Plan for the conservation of biological diversity and, in that context, shall cover a list of priority conservation projects which may include scientific research; surveys and inventories; elements essential to the identification, establishment, or maintenance of areas in which conservation should be ensured (including actions such as the establishment or maintenance of buffer zones, the reduction of pollution outside the area itself, and compensation to local populations); and the development of or support for sustainable economic activities relating to the use of wild species or of the natural environment which are consistent with the maintenance of biological diversity. Projects may also include the financing, over a period of several years, of operational costs incurred in the conservation of biological diversity, including - but not limited to - costs incurred in the operation of research facilities or programmes, staff training, maintenance of infrastructure and equipment, and education and information activities. (See: Draft Articles prepared by the IUCN for inclusion in a proposed Convention on the Conservation of Biological Diversity and for the Establishment of a Fund for that Purpose, June 1989).

VIII. OPERATIONAL GUIDELINES

36. Two operational guidelines can be drawn up from the brief examination of the nature and functions of the financial mechanisms.

37. First, the financial mechanisms developed must be regarded as a first approximation only. This is because a range of critical issues remain unresolved so far. Basic economic realities are not easily swept away, despite the need to deal with a considerable and increasingly critical concern. One such economic reality is the amount of financial transfers required to induce a certain level of conservation. This is a function of a habitat country's perception of its external debt, economic prospects for the medium- and long-term, and a domestic evaluation of the consequences of a loss of biological diversity. Another economic reality concerns the lack of managerial and enforcement capacities in many developing countries to ensure that unsustainable use of genetic resources is stopped or minimized. In other words, how can the monitoring of the loss of biodiversity be made binding and effective? In the light of the present economic conditions of the habitat

countries, with a crushing burden of unemployment, falling real income, budgetary constraints and the rigours of structural adjustment, it is unlikely that the terms under which financial transfers are to be used can be fully enforced. Indeed, even when annual or periodic compensation based on inspection is negotiated, the arrangement may grind to a halt much earlier than envisaged.

38. A second guideline that can be drawn up is that inadequate financial transfers and inappropriate financial mechanisms do not help to lighten the burden on the habitat countries to an extent and in a way that will ease the pressure on the unsustainable exploitation of genetic resources. This will require the transcending of the narrow parameters set by negotiations based on zero-sum games. A sense of global interdependence and global solidarity is needed. Concrete solutions must be sought in the intricate and immensely difficult trade-offs between the loss of earnings to be incurred by habitat countries and the need to arrest the accelerated extinction of plant and animal species. This will not be brought about by half-hearted measures that (i) continue to under estimate the totality of the financial commitments required or (ii) attempt to maintain control and dominance over the financial mechanisms established.

IX. CONCLUDING REMARKS

39. An analysis of the nature, scale and timing of the transfer of resources reveals a number of pertinent considerations. These considerations must be kept in mind not only in initiating negotiations for a framework legal instrument, but also in identifying the appropriate level of financial transfers and technical assistance, as well as the nature of the funding mechanisms to be established.

40. First, at present the habitat countries are largely unable to obtain either at a significant level or with any degree of exactitude, the economic and financial benefits that arise from the conservation and management of the Earth's biological resources.

41. Second, the designation of specific land areas for conservation of biological diversity often conflicts with alternative land uses in developing countries (range lands, cultivation of rain-fed crops, pastures, social forestry, human settlements, etc.), sometimes leading to considerable economic loss and political controversy and debate. In this situation, adequate financial transfers could provide a substantial incentive to adopt what could otherwise be politically difficult decisions.

42. Third, the availability of additional, concessional funds could, when coupled with effective project design and development, help to focus attention on biological diversity needs and obtain support for further investment programmes. This will be especially effective if institutional strengthening, the development of the human resources base, and the national capacity for managing conservation strategies in habitat countries are kept in focus.

43. Fourth, financial resources are likely to be forthcoming at adequate levels if the early focus is on action programmes, developed with the help of scientists, conservationists and government officials dealing with specific problems and regions of great concern.

44. Finally, there is clearly a need for an experimental initial or pilot approach that will bring to the fore what is actually needed to tackle the problems of conservation effectively, through a framework legal instrument, providing more scientific data and information on the scale and rate of extinction of species. Analysing the dose-response relationship of corrective measures, and obtaining a better understanding of the costs and benefits of financial transfers.

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Relationship Between Intellectual Property Rights and Access to Genetic Resources and Biotechnology

(A study prepared for the United Nations Environment Programme*)

* None of the views expressed in the study should be attributed to individual Governments or organizations.

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INTRODUCTION

1. Any invention pertaining to living matter and living things is at the same time a genetic resource and a technology. Subsequently, the legal framework applicable to genetic resources has always been bound to that applicable to inventions.

2. Nowadays, there is free access to genetic resources, without payment, all over the world. Plant breeders' rights, which protect the breeders, give an exclusive right to commercialization of a variety, but leave free access to the increased genetic resources contained within the variety. This system could be suppressed perhaps.

3. A lot of developed countries have opted for the patenting of genes and try to patent plant varieties and animal breeds. As a result, the exclusive rights will cover not only the invention, but also the resource included therein. This could involve a change in the legal framework governing genetic resources. Such resources would no longer be the common heritage of mankind, but would be owned by States.

4. The system outlined in paragraph 2 above is more desirable, because the transfer of technology is easier. Here the aim is to organize the circulation of genetic resources. Of the two modalities of intellectual property noted above, one must choose that which enables the circulation of genetic resources, i.e. plant variety rights.

I. HISTORY OF THE APPROPRIATION OF GENETIC RESOURCES

A. The initial pre-legal phase: freedom and problems

5. For a long time there were no legal rules to regulate the circulation of genetic resources, but this does not mean that such circulation was without constraints. Farmers exchanged specimens of interest among themselves, but possessiveness was never excluded. Rare and precious plants were frequently monopolized. At the global level, however, seeds circulated as people did. The establishment of the great empires gave rise to a great genetic intermixing. The idea of a free-circulation zone is perhaps the positive element that must be retained.

6. The central object of technical interest was the species. Attempts were made to discover new species, such as the potato. During this period, there was a great reduction in inter-specific variability, heralding the present-day situation in which 90 per cent of the food resources of the planet are based solely on about 30 species. Intra-specific variability was not exploited. The great famine in Ireland, resulting from the destruction of the potato crop due to blight, revealed the dangers of limiting the genetic base of crops.

7. Thus, there were no intellectual property rights, and access to genetic resources was free. However, industrialization and imperialism led to the concentration of genetic know-how and genetic resources in the developed countries, even though the developing countries retained the bulk of the in-situ biological diversity.

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B. The second phase: an invention is protected, but there is free access to the genetic resource

1. Establishment of the system governing new varieties of plants

8. Between 1930 and 1960, various industrialized countries passed laws giving the creators of new plant varieties a temporary monopoly on exploitation. In 1961, the convention establishing the Union for the Protection of New Varieties of Plants (UPOV) was signed by a number of industrialized countries. In practice this meant that, through a mechanism based on patent law, anyone who developed a new plant variety was given a monopoly on its commercial exploitation. This right is limited to varieties of plants, and does not include animals, micro-organisms, genes or species. The central object of technical interest became the variety. The emphasis changed from acclimatizing new species to improving them, by progressing from one variety to another within a single species.

9. The law on new varieties of plants differs considerably from patent law, since the monopoly is restricted in two ways. On the one hand, a farmer who has bought a batch of seeds from a seed company is entitled to retain a portion of his crop to resow his field the following year without paying royalties to the creator of the variety, whereas patent law makes such payment obligatory. This is what is called the "farmer's privilege", whereby the farmer pays only once for the technology contained in the batch of seeds he has bought, and he can dispose of all subsequent generations freely and without payment.

10. On the other hand, every creator of varieties is free to use a competitor's varieties, even though they are subject to a monopoly on exploitation. This is what is known as free access to protected varieties as a source of genetic variability. Of course, the seed cannot be produced and sold in competition with the original variety; but a protected variety can be used in the competitor's own breeding process to develop a new variety deriving from the first and containing some of its qualities. If, by cross-breeding, inducing mutations, etc., the competitor succeeds in creating a new variety, he is entitled to apply for a monopoly on its exploitation. The right he then obtains is completely independent of that accorded to the producer of the first variety, and no authorization nor royalty is needed. In other words, competitors are not entitled to dispose freely of the seed as a finished manufactured product; but, freely and without payment, they can dispose of the genetic resource and technology contained in the seed.

11. The subtlety of this system has not always been properly understood and, within the same grain of wheat, not everyone has been able to distinguish between the manufactured product, which is covered by a monopoly, and the genetic resource to which there is still free access without payment. It has often been thought that genetic resources are being subject to captation, which is not quite true. Similarly, plant breeders' rights have often been accused of having led to the genetic uniformity of crops, and this is not quite correct either. Animal breeds are probably more uniform, even though no intellectual property rights are involved. In actual fact, uniformity derives from production and marketing systems, and not from intellectual property rights.

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12. The farmer's privilege and free access, without payment, to protected varieties for the purpose of creating new varieties represent a radical difference between plant breeders' rights and patent law. The justification for this difference must lie in the very nature of the object of the invention: what is being protected in this case is not inert but alive. What is more, to create living organisms there must be parent organisms. If there is no free access to these, the creation of original new organisms will become difficult and expensive and will be reserved for very large firms with their own exclusive stock of genetic resources.

13. Under this system, it can be assumed that there is an imaginary "plant gene pool", including all wild plants, all older varieties and all cultivated plants, even if they are protected by plant breeders' rights. This whole genetic pool is freely available, without payment, to all parties to UPOV. Neither of the two main mechanisms for appropriation, State sovereignty and industrial property rights, prevent this. However, this does not mean, that there is no inequality between North and South. Without modern selection technology, the countries of the South are not able to take advantage of the free access to protected varieties to the same extent as the countries of the North. However, the farmers of the South have know-how in plant matters which would certainly enable them to take advantage of the circulation of protected seeds, whether by exercising the farmer's privilege or by crossing such seeds with local varieties. It must thus be regretted that more developing countries have not acceded to the UPOV Convention. At the same time, the existence of this plant varieties law would not prevent compensation mechanisms from being devised where genetic resources are sought in developing countries. Licensing mechanisms, with or without payment, are quite imaginable. It is virtually certain that the system has been criticized or even condemned through a lack of understanding, while its possibilities have by no means been exhausted.

2. The 1983 FAO International Undertaking on Plant Genetic Resources: such resources as part of the common heritage of mankind

14. At about the same time as the new plant breeders rights were developed, the decolonization movement began to bear fruit. Having regained their legal identity in the community of States, the developing countries still remained very dependent in economic matters. They had to undertake the lengthy task of recovering their resources and natural wealth, beginning with what at first sight appeared to be the most important thing, namely mineral wealth (cf. the legal concept of "permanent sovereignty over natural resources").

15. After a certain length of time, the idea emerged that the major plant collections amassed by the industrialized countries in the developing countries followed the same colonial logic as oil production concessions. From a strictly objective point of view the situations were somewhat different; taking away some plants or seeds does not exhaust the genetic resources of the place in which they have been gathered. Economically, however, the phenomenon is identical, although generally it has a smaller scope. The South furnishes the raw materials, without being able to organize the transfer of the technology.

16. Plants originating from the South are utilized in the North in breeding programmes to give an improvement in the dry matter content of tomatoes, increased resistance to certain diseases, etc. and such plants are gathered freely and without payment, whereas the seeds developed from them return after processing and then have to be paid for. Noting this, the developing countries sought recognition for their sovereignty over this natural wealth (the logical consequence of which was the power to authorize or forbid prospecting at their discretion) and the possibility of securing revenue from it. This met with total incomprehension on the part of the industrialized countries: were they to accept that the gathering of isolated specimens, which in no way detracted from the value of the zone or from the equilibrium or variability of the species, could be compared to the exploitation of mineral deposits? Plant life reconstitutes itself. Therefore, it seemed unthinkable to bestow a commercial value on it.

17. In 1983, the two sides met under the auspices of FAO, in mutual incomprehension. The industrialized countries were not yet ready to acknowledge that genetic resources possessed real value. Conversely, the developing countries did not understand that plant breeders' rights made genetic resources freely available to any country joining UPOV, even if the exploitation of varieties constituted a monopoly.

18. Agreement was reached on the fact that plant genetic resources were the common heritage of mankind, though today one might wonder whether that had any meaning, as the participants were not in agreement on the definition of genetic resources. From the economic standpoint, giving this status to plant genetic resources constituted a necessary but signally inadequate step. It should have been accompanied by specific compensation machinery to ensure that the countries which possessed resources were encouraged to undertake conservation activities. As a public good, the common heritage of mankind does not generate revenue. Market mechanisms therefore offer no encouragement for conservation.

19. The main advantage of the International Undertaking on Plant Genetic Resources was that it aroused interest in these questions, an opening for discussion, in which misapprehensions could gradually be dispelled.

C. The third phase: biotechnologies; the patenting, appropriation and widespread marketing of genetic resources

20. With the emergence of biotechnologies, it became difficult to identify objects technical of interest. Genetic resources became subject to greater detail, since the barriers of the species no longer constituted overwhelming obstacles. Any DNA fragment collected anywhere could constitute a genetic resource which would improve any type of living organism. Genetic resources of different types would therefore co-exist: genes; the cellular systems by which they are expressed; conventional genetic structures, such as wild or cultivated plants; or groups, such as varieties; or environments which become "gene pools".

21. Intellectual property law was also undergoing an upheaval. Invention, too, shifted to a more detailed level. In the plant world, invention no longer focused on the variety but on numerous constituent elements - gene fragments, processes, plant tissue, plasmids, cytoplasms, enzymes, proteins, etc. Subsequently, a demand was formulated that intellectual property rights should also cover animals. Finally, the companies that were most active in the field of microbiology sought patent protection for all these inventions,

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as they considered rights under the plant varieties law to be insufficiently remunerative. If these rights are replaced by patents and the range of intellectual property is extended to cover "living matter" in its entirety, this will generate a number of changes which it is necessary to understand.

1. From the first patents on living matter to generalized patentability (developments in the United States of America)

22. After some hesitation, a judge in the United States agreed that the time had come to grant industrial property rights in the new sphere of human activity constituted by genetic engineering. Considering micro-organisms, he decided to do away with the principle of the non-patentability of living matter and natural processes. He pointed out that the patent in effect related to a human activity in that the modification of the micro-organism's genome made it a veritable "chemical factory". It was patented as a chemical factory and its capacity as a living organism became unimportant. After the patentability of micro-organisms had been affirmed in 1980 by the United States Supreme Court, it was the turn of maize in 1985, an oyster in 1987 and a mouse in 1988. It should be noted that the courts have not confirmed that animal breeds are patentable, and that the principle is strongly challenged by a number of schools of thought, leading to a call for legislation on the matter.

2. Extension of the decision on patentability to the rest of the world

23. When a country like the United States takes such a far-reaching decision, the question immediately arises of its extension to the rest of the world. The multinational corporations in the chemical, petroleum and pharmaceutical industries, which have a prime interest in the development of the biotechnological mode of production, organized themselves within the International Chamber of Commerce to draw up their demands in legal form. They claimed that rights under the UPOV Convention could not guarantee sufficient remuneration for innovations related to biotechnologies, and asked that the patentability of living matter should be recognized, from the gene fragment to species and genera. The argument was restated by the World Intellectual Property Organization in a number of experts' reports.

24. For two reasons, the offensive was then taken up with the authorities of the European Community. The first reason was that the various countries in the European Community were bound by a European patent convention, which expressly excluded plant and animal varieties from patentability. The obstacle therefore had to be removed. The second reason was that a decision taken at the European level would make it possible to secure at a stroke uniform legal rules valid for the 12 community countries. Consequently, the Industry Department of the EEC Commission (DG III) produced a draft directive on the patentability of living matter which laid the foundations for new patent law applicable to all life. If the directive is adopted, other countries would find it very difficult not to fall into line eventually. In fact, this is the aim of an initiative currently under way within the General Agreement on Tariffs and Trade (GATT).

3. The European proposal for generalized patentability of living matter

25. The extension of patentable inventions affects all realms of living matter - micro-organisms, plants and animals. All manifestations of life are concerned. This means that living things will be patentable, that all the factors in the composition of living things will be patentable (genes, proteins, plasmids, DNA or RNA sequences, tissue, cell lines, probes, etc.), that all organized groups of living things will be patentable (plant and animal species and varieties, if they are products resulting directly from patentable processes), and that all processes will be patentable (processes for the insertion of genes, processes for the expression of genes, for cell culture, for protein production, etc.). Today the combination in greatest demand is an ensemble ranging from the identification of a gene to the organisms in which it is able to express itself - the individual, the line, the breed, the variety, the species, i.e. all realms of living matter. One of the fundamental consequences of the generalized patentability of life, as conceived today, is that the gene becomes the central object of technical interest.

26. Patent law acknowledges neither the farmer's privilege nor free access to patented inventions for the purposes of creation, and this is a fundamental factor in the ongoing transformation. Patent law allows exceptions for purposes of research - a patented process or product may be used in a research programme. However, if the programme succeeds in improving the patented invention, the permission of the patent holder is required in order to exploit the invention, and a royalty must be paid. This is what is known as a dependent invention. The patentee is free to refuse to authorize exploitation. Free access to genetic resources without payment, as stipulated in the plant varieties law, is contrary to patent law.

4. The draft amendment to the UPOV Convention: free or controlled access against payment

27. The proposal concerning patentability clearly raises a crucial problem for breeders of plant varieties. If the UPOV Convention is not amended, the varieties protected by the plant varieties law will be freely available without payment, unlike the genes and varieties protected by patent. In order to avoid this distortion, the members of UPOV have decided to amend the Convention, at least if those who support the concept of the patent continue to block access to genetic resources. In such a case, the rights under the plant varieties law would be brought into line with the patent, although to what extent is not yet known. A dependence mechanism would be instituted, based on the model of patent law.

28. In any event, a shift seems likely from the system of free access to genetic resources without payment to access against payment, though it is not yet known whether access will be free or controlled by the owner of the resource.

5. Common heritage and remuneration: the interpretation of the 1983 Undertaking and the IUCN draft articles on biological diversity

29. It was accepted in 1983 that genetic resources form part of the common heritage of mankind. For many that meant that they were freely available without payment. However, the industrialized countries were unwilling to make a gift of their high-performance varieties, and the developing countries were no longer willing to make their wild plants and local varieties available free of charge. All these reservations were based on errors that are only now beginning to be partly rectified. The first error is that, while the concept of the common heritage of mankind certainly means free access, it does not preclude payment for such access. Indeed, it enables such access to be managed through arrangements which give preference to the developing countries with a view to reducing inequalities. The second error is that protection of an invention under the plant varieties law does not preclude free access to the resource - in fact this is the crux of the plant varieties law.

30. Starting from these erroneous assumptions, States were unlikely to reach agreement. In 1989, however, they reached a compromise which stated that free access does not mean free access without payment. It means that the use of wild plants and local varieties can be subject to payment linked to "farmers rights". It is acknowledged that farmers' rights are rights which farmers in developing countries possess because they have "conserved, improved and made available plant genetic resources". They may therefore receive payment for the utilization of wild plants because they have conserved them, and for the use of local varieties because they have improved them. They make these resources available to the international community as "trustees" for present and future generations of farmers.

31. The free availability of these resources testifies to the fact that they form part of the common heritage of mankind. The fact that they are subject to payment serves to make North South trade more equitable, with farmers' rights being recognized in the same way as plant breeders' rights. Rights under the plant breeders' rights (as provided for under UPOV) have therefore been recognized as compatible with the FAO International Undertaking on Plant Genetic Resources of 1983. The balance struck is typical for the common heritage of mankind concept: free access and compensatory payment.

32. It is necessary to give a precise definition for farmers' rights. The parallel sought between farmers' rights and plant breeders' rights is somewhat dangerous. If equated with intellectual property rights, the farmer's rights would be temporary in nature and restricted to domesticated plants. However, it is clear that this is a means of remunerating work carried out on cultivated plants for thousands of years (it is therefore not temporary), and that the concept must allow for the integration of wild plants. In a way, the purpose is the payment of compensation for the fact that wild plants have not been destroyed in the name of economic development, and this amounts to rewarding an omission. All this should be spelt out.

33. The same kind of delicate balance between freedom of access to the common heritage and the possibility of paying for such access is found in the draft articles on biological diversity of the International Union for Conservation of Nature and Natural Resources (IUCN). Here again, it is recognized that

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biological diversity and all the genetic resources contained therein constitute the common heritage of mankind. The possibilities of remunerating use of resource are extensively explored, since any product developed from a genetic resource or by using it, in one generation or another, gives rise to payment of compensation.

6. Rejection of the concept of the common heritage of mankind?

34. If justice has been done to the UPOV Convention with a degree of delay, it may be regretted that FAO has not begun to explore the implications of the patentability of living matter for the legal regime governing genetic resources. If it is decided not to go beyond patent law in its conventional form, there will no longer be free access to genetic resources, even against payment. Such a decision may well have as its consequence an amendment of the UPOV Convention, moving in the direction of a closed system. Logically, the developing countries might then be tempted to follow such a movement. Instead of taking the view that genetic resources form part of the common heritage of mankind, with the international community as the trustee, they might be led to consider that they are the exclusive owners of such resources and that they can deny access to them, at their discretion, to anyone seeking it.

35. One might wonder whether such a trend is not emerging in various forums. There is a need for innovation in the form of users' fees, tax incentives or subsidies to correct market forces. This is an interesting idea. Reliance on market mechanisms makes it possible to avoid the organizational costs associated with administrative management and to ensure long-term operation. However, in the case of plant genetic resources and biological diversity, a number of obstacles would seem to hamper this approach.

36. In the first place, a degree of disaffectedness over the concept of the common heritage of mankind does not seem justified on objective grounds. The concept of the common heritage has lost none of its interest, since it allows free access to be reconciled with possibilities for control and payment. In recent reports, FAO acknowledges that the concept of the common heritage of mankind is not incompatible with the principle of free access against payment. This helps to clarify the debate on plant genetic resources (see "Interpretation of the International Undertaking on Plant Genetic resources" FAO document C89/24). This point cannot be over-emphasized. Both experience and economic theory show that recognition of common ownership in a regime of pure competition tends to lead to the exhaustion of a natural resource. It is therefore vital to insert corrective factors such as charges in order to bring about a degree of efficiency in resource exploitation. Economic thinking holds that unified control of the resource is the ideal solution.

II. INTELLECTUAL PROPERTY RIGHTS AND TRANSFER OF TECHNOLOGY

A. Payment for biological diversity and genetic resources

37. Biological diversity is a collective asset, even if in geographical terms it belongs to one region of the world or another. Management of biological diversity therefore necessitates transnational law, the basis of which must be an international convention. But certain regions of the world have harmed biological diversity more than others. They should provide compensation for the damage caused. Here one cannot speak of all being equal vis-à-vis the burden of preserving biological diversity, but of inequality for purposes of compensation.

1. Biological diversity, national sovereignty and the common heritage of mankind

38. The preservation of biological diversity requires, in the first place, the preservation of zones of diversity, identified as the result of an evaluation operation. Such preservation entails a number of economic sacrifices - no use of fertilizers, for example, no urbanization, re-routing of roads, etc. All these sacrifices present a form of partial expropriation of territory in a higher common interest. In consideration of the sovereignty which is exercised over such territory, the international community must pay compensation.

39. Moreover, because national sovereignty is a fundamental value upon which environmental constraints must not infringe, arrangements for the protection of biological diversity must be adopted by consent and not imposed. Unilateral decisions are to be ruled out, whatever form they may take. Thus, the only possible legal basis is an international convention or regional instruments. But it is necessary to ensure that the convention does not provide for the delegation of power to central agencies whose function would be to draw up standards. Standards should be developed jointly, and applied by the management bodies. The current version of the IUCN draft articles on biological diversity allows for too many cases of delegation of power on fundamental matters to the scientific authorities set up under the draft articles.

40. The inclusion of biological diversity and genetic resources in the common heritage of mankind does not run counter to the principle of national sovereignty or conflict with forms of resource development based on free access against payment. However, this development option is only marginal and does not release the international community from its responsibilities with respect to the conservation of the genetic heritage. The project for the establishment of an international fund to finance the protection of biological diversity is therefore vital. But it seems essential to link the use of the fund with the necessary transfer-of-technology operations. In many cases, monetary compensation for the costs of conservation will not be the most suitable method. Rather than compensation along the lines of debt-for-nature swaps, of which there have been several examples since 1987, we suggest a compensation mechanism based on technology-for-nature swaps. As far as possible, it is necessary to try to treat as a single whole the proposal for an international fund put forward by UNEP and FAO's international fund for plant genetic resources. This would mean that the terms of trade could be dealt with in an overall negotiating process.

41. Annual investments in the conservation of plant genetic resources amount to $50-60 million. This figure represents less than 0.5 per cent of world seed sales, or the equivalent of the R + D budget of the biggest seed firm. Some experts estimate that the cost of the conservation of biological diversity and plant genetic resources amounts to $500 million. This is probably a very low estimate. It might be made more accurate by recourse to technical assessments and recent methods of cost/benefit analysis (models with an "option value" approach).

2. Genetic resources: free exchange and industrial property rights

42. To guarantee the free exchange of genetic resources, the best legal framework is as follows: all the inventions are protected by plant breeders' rights, and all the genetic resources are protected by farmers' rights.

43. GATT is perhaps a good forum for the global negotiations. In order to make the terms of competition more equal among all countries in the world, a way must be found to share out the burden of maintaining the planet's biological diversity, since it will benefit everyone, although the countries of the North have already largely destroyed the diversity that their territories once contained. But these negotiations must be genuinely global and should not cover solely the question of patents, which can only be understood in relation to the maintenance of biological diversity and free access to genetic resources.

44. Regarding an international fund for biological diversity, there would seem to be no alternative to the principle of mandatory contributions. However, it is possible to envisage the payment of royalties when a product or process is derived from the use of protected biological sources. In order to encourage users to declare such a source, special provisions might be included as part of the search procedures for the granting of intellectual property rights. This source of income would be particularly valuable in the case of pharmaceutical products.

45. Payment of royalties might also be applied when the biological source leads to the creation of a process providing a substitute for export goods. In this case, the royalty would be calculated on the basis of the principle of compensation for income forgone by the traditional exporter. Such a solution, which has points in common with the IUCN draft articles, should be the subject of detailed study from both the legal and economic standpoints. If various sources of financing are envisaged (mandatory contributions, voluntary contributions and fees from intellectual property rights), care must be taken to ensure that they are not cumulative in respect of the same item.

B. Technology transfer mechanisms

46. With regard to genetic resources or biological diversity in general, it can be said that access to genetic resources is in a way inseparable from access to technologies. The UPOV Convention gives much attention to the principle of free access to genetic variability. More systematic use of the possibilities it offers seems necessary. Strictly speaking, the transfer of technology cannot be decreed. However, general mechanisms can be provided to strengthen the existing system.

47. Concerning access to genetic resources, the UPOV Convention has various provisions as mentioned above (free access to the protected variety as a source of initial variability, farmer's privileges). These provisions constitute real tools for the transfer of technology. In view of the importance of the principle of free access, much greater use should be made of this Convention. To this end, it would be desirable for the Convention to be applicable to other living organisms and to be signed by the countries of the South, very few of which are members. Such an approach could be advocated in the current GATT negotiations on intellectual property.

48. Access to technologies basically presupposes an increase in the absorption capacity of the countries of the South. From this standpoint, the accent must be on specific technologies which often make use of tacit knowledge and local learning processes. This know-how is built up over time and is not easily transferable, for it cannot be separated from a particular process by which human resources learn. At a time when the potential of biotechnology is often overestimated, it is necessary to focus on research capabilities for the improvement of plants and the technologies associated with them. It is quite impossible to do without these specific technologies. But it is perfectly possible to use biotechnologies, such as in vitro micro-propagation, provided that they are properly learned.

49. As in the case of the protection of areas of biological diversity, investment in the transfer of technology must be focused more on concrete projects than on organizations. The potential of International Agricultural Research Centres (with an annual budget of $260 million) is vital and must be used within a framework of decentralized projects. Other forms of co-operation must be encouraged: co-operation between public research bodies, as well as private/public or private/private co-operation.